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09/005,006	01/09/1998	SHUICHI KANNO	ASA-695	1954

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EXAMINER

NGUYEN, NGOC YEN M

ART UNIT	PAPER NUMBER
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1754

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/22/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

09/005,006

Applicant(s)

KANNO ET AL.

Examiner

Ngoc-Yen M. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 December 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 40-46, 48-51 and 79-89 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 40-46, 48-51, 79-89 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application
- ☐ Other: _____

DETAILED ACTION

In this office action, the species of C-F as the compound in the gas stream and aluminum oxide-nickel oxide catalyst are being examined. These species were elected without traverse in Paper No. 6 (filed July 26, 1999). Since there is no clear request from Applicants to shift to other species when filing the request for continued prosecution application, only the originally elected species are treated on the merit in this office action.

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 40-46, 48-51, 79-89 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

There is no sufficient support for the limitation of "a decomposition of 80% or more" as required in the instant claims 40, 48, 80 and 81, 82, 83 because "ore more" would include higher values such as 100%. Applicants have pointed out that support for such limitation can be found in Figures 7 and 12, however, in Figure 7, only decomposition rate for C_2F_6 is shown and the rate did not reach 100%. In Figure 12, the highest point shown for the decomposition rate for SF_6 is 60%, only the decomposition rate of C_3F_8 reached 100%. Support for some points for some species is

not sufficient to give support for the entire claimed range for all the claimed species. Applicants also argue that Figure 9 and page 39, lines 15-16 show that for CF_4 , the decomposition rate reached 100%. Again, even if the decomposition rate of CF_4 is 100%, such disclosure still cannot provide sufficient support for 100% decomposition rate for all C-F species. It should be noted that on page 39 of Applicants' specification, it is disclosed that "substantially 100% decomposition rate can be obtained", however, "substantially 100%" is not the same as "100%".

For claim 88, Applicants are requested to point out support in the instant specification, by page and line numbers, for the limitation of "said catalyst further comprises sulfate". It should be noted that catalyst required in the independent claims contains alumina and nickel oxide, however, in the specification, the sulfate ions are disclosed only for titanium oxide containing catalyst, note for example page 7, first full paragraph, Example 5.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 40-43, 45-46, 48-49, 51, 79-86 are rejected under 35 U.S.C. 103(a) as obvious over Rossin et al (6,069,291), optionally in view of Okazake et al (5,151,263) and Imamura (5,649,985).

Rossin '291 discloses a process for the decomposition of perfluoroalkanes to HF and CO_2 (note claim 1). The process comprises contacting the perfluoroalkanes with aluminum oxide. The perfluoroalkane is contacted with aluminum oxide at a

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temperature ranging from about 400°C to about 1000°C, or preferably from about 550°C to 800°C (note column 2, lines 55-65). This range is well within the claimed range. The decomposition temperature of C_2F_6 is 750°C (note Example 1. This value is well within the claimed range.

Rossin '291 discloses that perfluoroalkanes are CF_4 , C_2F_6 , etc. (Note column 1, lines 25-28). Rossin '291 discloses, in Example XIX, a concentration of 5,000 ppm (= 0.5%) tetrafluoromethane (CF_4) in the gas to be treated. This value is well within the claimed range. For the other values of the claimed range, Rossin '291 does not disclose any limit for the concentration of the perfluoroalkanes in the gas to be treated. Thus, it would have been obvious to one of ordinary skill in the art to use the process of Rossin '291 to treat any exhaust gas, which contains perfluoroalkanes, especially when the gas was generated during electrolytic aluminum smelting, during tetrafluoroethylene manufacture, and during semiconductor manufacture (note column 3, lines 48-54).

The aluminum oxide is stabilized, for example, with an element selected from the group consisting of barium, calcium, nickel among others (note sentence bridging columns 2-3). The catalyst is formed by slurring pseudoboehmite aluminum oxide (which is encompassed by the claimed "boehmite") in an aqueous or non-aqueous liquid. Once mixed, one or more additional components may be added to the slurry. These additional components may be added as solid metal salts, such as nitrates, acetates, oxalates, chlorides, halides, etc., or may be added as small metal or metal oxide particles. Once mixed, the slurry may be aged, if desired, or used directly in the manufacture of beads, particles, spheres, etc., or used to coat an inert ceramic substrate, such as a monolith. Following manufacture or coating of the inert ceramic substrate, the resulting material must be calcined at a temperature between 350 and

900°C (note column 4, lines 36-55). The calcination would convert the additional components into oxide forms if they are not already were.

Rossin '291 further discloses that the process is also applicable to the injection of gaseous or liquid phase perfluoroalkanes into a gas stream, including an oxidizing agent, such as air for example, and water (which would become steam at reaction temperature) (note column 5, lines 28-37 and column 3, lines 8-11).

In Rossin '291, since Ni is specifically disclosed as one of the additional components that can be added to the aluminum oxide catalyst, thus, the disclosure of Rossin is considered as having "sufficient specificity" to include alumina-nickel oxide catalyst.

In any event, it would have been obvious to one skilled in the art to select any combination among the specifically disclosed compounds, i.e. nickel-aluminum oxide, *Merck & Co. Inc. v. Biocraft Laboratory Inc.* 10 USPQ 1846.

Rossin further discloses that if the concentration of hydrofluoric acid in the effluent stream is deemed unacceptable, conventional collection or abatement process, such as caustic scrubbing, may be employed to avoid venting acid gases directly into the atmosphere (note column 5, lines 44-48). The processes steps as required in the instant claims for removing HF from the exhaust gases are conventional and well known steps in the art.

For claim 79, Rossin discloses that perfluoroalkanes are released to the environment during certain industrial processes, such as during semiconductor manufacturing processes (note column 1, lines 21-30). Thus, It would have been obvious to one of ordinary skill in the art at the time of the invention was made to treat any perfluoroalkanes which were released from any semiconductor manufacturing

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process, including when such perfluoroalkanes were used as etchants or cleaners for semiconductor processes.

Optionally, Imamura '985 is applied to teach that HF is a water-soluble component (note column 6, lines 48-49) and it can easily be removed by scrubbing with water (note claim 1). In Figure 1, the water scrubber comprises a nozzle 1e, which fairly teaches the "spray washing" of the gas with water to remove acidic gases.

Optionally, Okazaki '263 can also be applied to teach that acid compounds such as HCl, HF can be absorbed and neutralized by alkali (note column 4, lines 31-34).

Rossin discloses that the catalyst composition comprises aluminum oxide with the addition of between 0.01 and 50% of one or more elements selected from the group consisting of nickel among others (note paragraph bridging columns 3-4). The composition of the catalyst recited in Rossin '291 is stated in weight percent and were calculated based upon the elements described. When the metal component or components were added by wet impregnation techniques, the weight percent of the metal(s) within the impregnation solution and the amount of impregnation solution used to prepare the catalyst. When the metal component or components were added to the aluminum oxide precursor slurried in water, the weight percent of the metal component(s) were calculated from the amount of aluminum oxide precursor and the amount of metal(s) present within the slurry, the weight loss upon ignition of the aluminum oxide precursor (note column 6, lines 1-15). Rossin does not specifically disclose the atomic ratio.

However, from the weight percent, one skilled in the art can calculate to figure out the atomic ratio. In Example IV, using 60g/mole as the molecular weight for the pseudoboemite "AlO(OH)", and 148.3 g/mole for the magnesium nitrate, the atomic ratio

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of Al:Mg is calculated to be out 49:1. In Example XIII, using 159 g/mole for the zirconium hydroxide and the atomic ratio of Al:Zr is calculated out to be about 2.65:1. These values are within the claimed range. Even though, Rossin '291 does not use nickel as the metal component in any of the Examples, however, one skilled in the art would have reasonably expected that the mole ratio of Al to Ni and any Zn would also be within the claimed range. Moreover, it would have been obvious to one of ordinary skill in the art to optimize the atomic ratio of aluminum to nickel based on the disclosed range stated above to obtain a catalyst best suited for transforming perfluoroalkanes.

In Example XIX, the conversion % at 750°C was 97.5% (note column 13), thus, Rossin '291 fairly teaches that the catalyst used can promote the decomposition of the fluorine compound at a decomposition rate of 97.4%. This value is well within the claimed ranges. It should be noted that there is no minimum time requirement for "maintained". The decomposition rate as disclosed in Rossin '291 is considered as being "maintained" at least along enough to achieve such rate.

Claims 44, 50, 87-89 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rossin '291, optionally further in view of Imamura '985 or Okazaki '263 as applied to claims 40-43, 45-49, 51, 79-86 above, and further in view of Rosenbaum (5,460,792).

The difference not yet discussed is Rossin '792 does not disclose the addition of zinc oxide.

Rosenbaum '792 discloses a process for the destruction of hydrocarbon compounds, which uses a catalyst comprising a carbonaceous pyrolyzed resinous polymer. The catalyst is doped with a compound selected from the group consisting of metal oxides, metal oxyhalides or precursor metal salts wherein the metal of the metal oxides, metal oxyhalides and precursor metal salts is selected from the group consisting

of Sc, Ti, V, Cr, Mn, Fe, Co, Ni, Co, Zn, Pd, Nb, Zr, Mo and mixtures thereof (note claim 1). Rosenbaum '792 further discloses that the process can be used for the destruction of organic compounds, which refer to either halogenated organic, or hydrocarbon compounds or mixture thereof (note column 4, lines 15-18). Exemplified compounds, which can be destroyed, are C_2Cl_4 , CCl_4 (note column 16, lines 6 and 9), Rosenbaum '792 teaches that the halide can be any halide, while chlorine and bromine are being preferred (note column 7, lines 28-26). Rosenbaum '792 further disclose that the compounds for the dopants can be precursors which form the metal oxide or metal oxyhalide, typically be hydrolysis or decomposition, such as nitrate, sulfate, etc. (note column 14, lines 3-19). When a sulfate is used, there would be some sulfur in the final catalyst product as required in the instant claims.

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to further include zinc in the catalyst of Rossin '792 because Rosenbaum '792 suggests that zinc, just as nickel, would promote the destruction of the halogenated hydrocarbon.

Applicant's arguments filed December 14, 2006 have been fully considered but they are not persuasive.

Applicants argue that in Figure 9, and page 39, lines 15-19 shows that for CF_4 , the decomposition rate reached 100%. Furthermore, Examples 10-11 (it should be Examples 11-12, instead of 10-11 as stated by Applicants) showed decomposition rates of "99% or more". Applicants further argue that Figure 12, discloses decomposition rates beginning with just over 0% and continuing up to 100% for both C_4F_8 and C_3F_8 .

Even if adequate written description does not required that each and every species of a claimed genus be specifically described, however, in order to a create a

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range from the disclosed values, either in the specification or in the Figures, the end values for such range must be for the species and for the catalyst used, etc. In this case, the only support found for "80%" is for the decomposition of C_2F_6 using alumina-titania catalyst (note Example 4, especially page 25, 9-11 and 14-16). The "100%" as pointed out by Applicants as having support from Figure 9 and Figure 12, such value is for decomposing CF_4 or other C-F compound using alumina-nickel oxide catalyst, not alumina-titania catalyst. As for Examples 11 and 12, the "99% or more" is for decomposing SF_6 and NF_3 , respectively. Having one end value for one species and another end value for another species is not sufficient to create a range for the genus, especially when catalyst art is highly unpredictable and the decomposition rate is highly dependent on the process temperature.

Applicants argue that catalyst chemistry is complex and unpredictable, and the mere mention of Ni as a possible catalyst component does not make it obvious to use in the same atomic ratio as the other components.

First, it would have been obvious to one of ordinary skill to select nickel as the other component for the aluminum oxide catalyst in Rossin '291, because nickel is specifically recited as a suitable component, *Merck & Co. Inc. v. Biograph Laboratory Inc.* 10 USPQ 2d 1846. Second, the other two examples were used to prove that an overlapping range for the weight % of the component, such as Mg, Ni, Zr, etc., would produce an overlapping range for the atomic ratio. With respect to the encompassing and overlapping ranges previously discussed, the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time of invention to select the

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portion of the prior art's range which is within the range of the applicants' claims because it has been held prima facie case of obviousness to select a value in a known range by optimization for the results. *In re Boesch*, 205 USPQ 215. Additionally, the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time invention was made to have selected the overlapping portion of the range disclosed by the reference because overlapping ranges have been held to be a prima facie case of obviousness. *In re Malagari*, 182 USPQ 549. Applicants have not provided any evidence to show criticality or unexpected for the claimed ranges for the nickel amount in the catalyst.

Applicants argue that secondary references do not make up for the failure of Rossin to teach the claim limitation discussed above.

The secondary references are applied to teach the step of removing the acid gas the decomposition step, not to teach the ratio of nickel oxide in the catalyst or any other limitations.

Applicants pointed out that Example 6 compares various catalysts containing alumina and another element. This side-by-side comparison of many catalysts showed that the two containing Ni were superior in achieving high reduction rate of CF compounds.

The above mentioned side-by-side comparison might show that the catalysts containing Ni were superior, however, this showing is limited to C₂F₆ compound. As evidence of Rossin '291, the claimed C-F compound, in this case is CF₄, can be decomposed with 97.4% conversion rate without using a catalyst containing nickel.

Thus, the showing in Figure 6 is not sufficient to show that there was an unexpected results when using nickel containing catalyst to decompose any C-F compound.

Applicants argue that in the declaration filed February 7, 2002, Mr. Kanno declared that "[o]ne skilled in the art would have expected a rapid deterioration of catalytic activity during treatment of a gas having a concentration of 5,000 ppm of a fluorine compound."

This statement is not commensurate in scope with Applicants' claims. There is no time requirement for the claimed process.

Applicants argue that there is no need to recite the claims the time period of high reduction rate achieved by the claimed methods.

Some properties may not need to be include in the claims if they are inherently achieved, for example, by using deionized water, purer product can be obtained. However, in this case, if the treatment process were required to run for only a short duration, the alleged unexpected results of "extended use" would not be considered as "inherent". Furthermore, in Rossin '291, all the conversion disclosed is higher than 90%, even if after the number hours disclosed, the conversion did drop off, there is still evidence to show that the drop off in Rossin '291 was significant so that the treatment duration time for obtaining a conversion rate between 80%-100% is much shorter than that of the claimed invention.

Applicants argue that there is no need to recite in the claims the time period of high reduction rate achieved by the claimed methods. Applicants further argue that the claims recite the conditions under which the superior results are achieved, and under such conditions, the superior results are a necessary result of the claimed invention.

First, the time period of high reduction rate achieved by the claimed method is not inherent in the subject matter. The life of the catalyst used in the claimed process is

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inherent property for the catalyst, however, the duration of the process does not have to be the same as the life of the catalyst. The duration of the process can be much shorter such as when the process is complete before the end of the catalyst life. Secondly, if Applicants insisted that the duration of the process is inherent when performed the claimed process at the required condition, such duration would also be inherent in the process of Rossin '291 because the process of Rossin '291 has all the positive process conditions as required in the claimed process (note above rejection). In the event that the claimed process using a catalyst which was produced by a particular way in order to achieve a long life for the catalyst and "inherently" a long duration for the claimed process, such limitation must be included in the claims.

Applicants argue that claim 40 is now required "spray washing the treated gas to neutralize or remove the hydrogen fluoride".

The nozzle as disclosed in Imamura fairly teaches that the "spray washing" in a water scrubber is known and conventional in the art.

Applicants argue that Imamura discloses the removal of powder dust by water spray, not for removing HF.

It should be noted that the water scrubber is used to remove at least one of water-soluble component **and** dust (note claim 1) and HF is one of the water-soluble component (note column 2, lines 45-51).

The rejection over Rossin in view of Rosenbaum is maintained for the same reasons as stated above.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ngoc-Yen M. Nguyen whose telephone number is (571) 272-1356. The examiner is currently on a Part time schedule.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Ngoc-Yen M. Nguyen
Primary Examiner
Art Unit 1754

nmn
March 19, 2007